AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claim 1. (Cancelled)

2. (Currently Amended) A data communication method~~, wherein data to be transmitted is represented by a time interval, and a first specific sequence having a sharp autocorrelation function and a second specific sequence having a specific relation with said first specific sequence are used as a sequence of said data represented by the time interval~~ comprising the steps of:

transmitting on one communication path first specific sequences having a sharp autocorrelation function; and

interposing a second specific sequence between transmissions of said first specific sequences, wherein

a time interval of the interposed second specific sequence is used to represent data to be transmitted,

the time interval of the interposed second specific sequence varies depending upon the data to be represented,

data to be transmitted is represented by each of the first specific sequences as well as by the time interval between an immediately preceding first specific sequence and a next first specific sequence, and

when the immediately preceding first specific sequence is one of a first sequence and a second sequence, and the next first specific sequence is one of the first sequence and the second sequence, data to be transmitted is represented by the time interval between any of the first sequence followed by the second sequence, the second sequence followed by the first sequence, the first sequence followed by the first sequence, and the second sequence followed by the second sequence.

3. (Previously Presented) The data communication method according to claim 2, wherein a binary sequence is used as said first specific sequence and said second specific sequence, and said time interval is set on a bit basis.

Claims 4 - 5 (Cancelled)

6. (Original) The data communication method according to claim 3, wherein a pseudo-noise sequence (PN code) is used as said first specific sequence.

7. (Previously Presented) The data communication method according to claim 3, wherein a Barker sequence is used as said first specific sequence.

8. (Currently Amended) The data communication method according to claim 3, wherein ~~the number of corresponding bits having a same value minus the number of corresponding bits~~

~~having different values in a partial received sequence and said first specific sequence is used as a correlation value therebetween, said~~

a partial received sequence ~~being~~ is obtained by extracting from a received sequence a continuous part having a same length as that of said first specific sequence, and

a correlation value between the partial received sequence and the first specific sequence is obtained by taking the number of bits of the partial received sequence that have a same value as a corresponding bit of the first specific sequence and subtracting the number of bits of the partial received sequence that have a different value as a corresponding bit of the first specific sequence.

9. (Currently Amended) The data communication method according to claim 7, wherein

A = 11100010010 and a sequence having each bit of A inverted, i.e., B = 00011101101, are used as said first specific sequence,

when A is followed by A, then one of a part of and an entirety of 1, 11, 110, 1101 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between A followed by A,

when A is followed by B, then one of a part of and an entirety of 1, 10, 100, 1001 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between A followed by B,

when B is followed by B, then one of a part of and an entirety of 0, 00, 001, 0010 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between B followed by B, and

when B is followed by A, then one of a part of and an entirety of 0, 01, 011, 0110 are ~~partially or entirely~~ used for communication.

10. (Currently Amended) The data communication method according to claim 7, wherein A = 1011000 and a sequence having each bit of A inverted, i.e., B = 0100111, are used as said first specific sequence,

when A is followed by A, then one of a part of and an entirety of 1, 11, 111, 1110 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between A followed by A,

when A is followed by B, then one of a part of and an entirety of 0, 00, 000, 0001 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between A followed by B,

when B is followed by B, then one of a part of and an entirety of 0, 00, 000, 0001 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between B followed by B, and

when B is followed by A, then one of a part of and an entirety 1, 11, 111, 1110 are ~~partially or entirely~~ used for communication.

11. (Currently Amended) A data communication system for representing data to be transmitted on one communication path by a time interval, and interposing said data represented by the time interval between first specific sequences for transmission between a transmitter and a receiver, said first specific ~~sequence~~ sequences having a sharp autocorrelation function, wherein

said transmitter includes

a converting means for converting said data to be transmitted into said time interval,

a storage means for storing said first specific ~~sequence~~ sequences, and

a transmitting means for interposing said time interval obtained by said converting means between said first specific sequences stored in said storage means for transmission on said one communication path, and

said receiver includes

a detection signal generating means for detecting ~~said~~ each first specific sequence in a received sequence on said one communication path by detecting whether correlation between a partial received sequence and said each first specific sequence exceeds a threshold value or not, and generating a detection signal at a corresponding timing, said partial received sequence being obtained by extracting from said received sequence a continuous part having a same length as that of said each first specific sequence, and

a restoring means for restoring the data based on ~~a~~ the time interval between detection signals from said detection signal generating means minus the length of said each first specific sequence.

Claim 12. (Cancelled)

13. (Currently Amended) A data transmitting device for representing data to be transmitted on one communication path by a time interval and interposing said data represented

by the time interval between first specific sequences for transmission, said first specific ~~sequence~~ sequences having a sharp autocorrelation function, comprising:

a converting means for converting said data to be transmitted on said one communication path into said time interval;

a storage means for storing said first specific ~~sequence~~ sequences; and

a transmitting means for interposing said time interval obtained by said converting means between said first specific sequences stored in said storage means for transmission on said one communication path.

14. (Currently Amended) A data receiving device for receiving a received sequence on one communication path, said received sequence being formed from a time interval representing data to be transmitted and first specific sequences interposing said time interval therebetween, said first specific ~~sequence~~ sequences having a sharp autocorrelation function, said data receiving device comprising:

a detection signal generating means for detecting ~~said~~ each first specific sequence in said received sequence on said one communication path by detecting whether correlation between a partial received sequence and said each first specific sequence exceeds a threshold value or not, and generating a detection signal at a corresponding timing, said partial received sequence being obtained by extracting from said received sequence a continuous part having a same length as that of said each first specific sequence; and

a restoring means for restoring the data based on a the time interval between detection signals from said detection signal generating means minus the length of said each first specific sequence.

15. (Original) The data receiving device according to claim 14, further comprising a means for varying said threshold value.

16. (Currently Amended) The data receiving device according to claim 15, wherein

~~the number of corresponding bits having a same value minus the number of corresponding bits having different values in a partial received sequence and said first specific sequence is used as correlation therebetween, said partial received sequence being obtained by extracting from said received sequence a continuous part having a same length as that of said first specific sequence,~~

a correlation between the partial received sequence and said each first specific sequence is obtained by taking the number of bits of the partial received sequence that have a same value as a corresponding bit of said each first specific sequence and subtracting the number of bits of the partial received sequence that have a different value as a corresponding bit of said each first specific sequence,

A = 11100010010 and a sequence having each bit of A inverted, i.e., B = 00011101101, are used as said first specific sequence,

when A is followed by A, then one of a part of and an entirety of 1, 11, 110, 1101 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between A followed by A,

when A is followed by B, then one of a part of and an entirety of 1, 10, 100, 1001 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between A followed by B,

when B is followed by B, then one of a part of and an entirety of 0, 00, 001, 0010 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between B followed by B, and

when B is followed by A, then one of a part of and an entirety of 0, 01, 011, 0110 are ~~partially or entirely~~ used as a 1 to 4-bit second specific sequence interposed between B followed by A, and

said threshold value is set to 10 and –10 in a period shorter than the length of said each first specific sequence by 1 bit after generation of said detection signal, and is otherwise set to 6 and –6.

17. (Currently Amended) The data receiving device according to claim 15, wherein

~~the number of corresponding bits having a same value minus the number of corresponding bits having different values in a partial received sequence and said first specific sequence is used as correlation therebetween, said partial received sequence being obtained by extracting from said received sequence a continuous part having a same length as that of said first specific sequence,~~

a correlation between the partial received sequence and said each first specific sequence is obtained by taking the number of bits of the partial received sequence that have a same value as a corresponding bit of said each first specific sequence and subtracting the number of bits of the partial received sequence that have a different value as a corresponding bit of said each first specific sequence,

A = 1011000 and a sequence having each bit of A inverted, i.e., B = 0100111, are used as said first specific sequence,

when A is followed by A, then 1, 11, 111, 1110 are used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between A followed by A,

when A is followed by B, then 0, 00, 000, 0001 are used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between A followed by B,

when B is followed by B, then 0, 00, 000, 0001 are used as a 1 to 4-bit second specific sequence interposed ~~therebetween~~ between B followed by B, and

when B is followed by A, then 1, 11, 111, 1110 are used for communication, and

said threshold value is set to 6 and −6 in a period shorter than the length of said first specific sequence by 1 bit after generation of said detection signal, and is otherwise set to 4 and −4.

18. (Withdrawn) A bidirectional data communication system including at least two terminal devices connected on a one-to-one basis through a transmission path of a single-core optical fiber, for transmitting and receiving data, wherein each of said terminal devices includes

a full-duplex encoding means for conducting encoding operation in a full-duplex transmission mode in which input packet data is always transmitted and received simultaneously,

a half-duplex encoding means for conducting encoding operation in a half-duplex transmission mode in which a transmission direction (transmission and reception) of said input packet data is switched with time,

a selector for selecting an output of said full-duplex encoding mean and an output of said half-duplex encoding means,

a transmitting means for transmitting an output of said selector to one terminal device through said optical fiber,

a communication control means for switching said selector and applying an input arbitration signal and input packet data to said full-duplex encoding means and said half-duplex encoding means to control an output to the other terminal device,

an upper layer for outputting an arbitration signal and packet data to said communication control means according to a protocol and receiving an arbitration signal and packet data from said communication control means,

a receiving means for receiving information transmitted from the other terminal device through said optical fiber,

a full-duplex decoding means for decoding an arbitration signal and packet data based on said information received by said receiving means for output to said communication control means, and

a half-duplex decoding means for decoding an arbitration signal and packet data based on said information received by said receiving means for output to said communication control means, wherein

full-duplex communication is used for arbitration of transmission, and half-duplex communication is used for data transmission.

19. (Withdrawn) The bidirectional data communication system according to claim 18, wherein said full-duplex decoding means has an error correcting function that works only in full-duplex transmission, whereby an error rate resulting from electromagnetic coupling noise is improved.

20. (Withdrawn) The bidirectional data communication system according to claim 1, wherein said communication control means reduces a handled frequency by reducing a transmission rate only in said full-duplex transmission, whereby an error rate is improved.

21. (Withdrawn) The bidirectional data communication system according to claim 1, wherein said communication control means causes said one terminal device to transmit continuously or intermittently and the other terminal device to transmit intermittently in said full-duplex transmission, whereby power consumption for transmission of the intermittently transmitting terminal device is reduced.

22. (Withdrawn) The bidirectional data communication system according to claim 1, wherein said terminal devices use different light wavelengths for transmission so as to prevent a signal transmitted from the terminal device itself from being mixed with a signal received by that terminal device, whereby an error rate is improved.

23. (Withdrawn) The bidirectional data communication system according to claim 1, wherein said terminal devices use different modulation methods for transmission so as to enable full-duplex transmission through a single optical fiber.

24. (Withdrawn) The bidirectional data communication system according to claim 1, wherein said terminal devices enable transmission according to IEEE1394 on said transmission path.